AD

COMPOSING SYSTEM for TECHNICAL REPORTS

TECHNICAL REPORT
72-65-QAEO

by

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and
Clinton L. Eklund

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June 1972

UNITED STATES ARMY
NATICK LABORATORIES
Natick, Massachusetts 01760

U.S. ARMY MATERIEL COMMAND

Quality Assurance & Engineering Office

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UNCLASSIFIED
Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY *(Corporate author)* U.S. Army Natick Laboratories Natick, Massachusetts 01760	2a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED 2b. GROUP

3. REPORT TITLE

Composing System for Technical Reports

4. DESCRIPTIVE NOTES *(Type of report and inclusive dates)*

Research Management Study

5. AUTHOR(S) *(First name, middle initial, last name)*

Richard A. Elwell and Clinton L. Eklund

6. REPORT DATE	7a. TOTAL NO. OF PAGES	7b. NO. OF REFS
1972	10	

8a. CONTRACT OR GRANT NO.	9a. ORIGINATOR'S REPORT NUMBER(S)
b. PROJECT NO.	72-65-QAEO
c.	9b. OTHER REPORT NO(S) *(Any other numbers that may be assigned this report)*
d.	

10. DISTRIBUTION STATEMENT

This document has been approved for public release and sale; its distribution is unlimited.

11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY
	US Army Natick Laboratories Natick, Massachusetts 01760

13. ABSTRACT

A technical report is any preliminary or final technical document written for the permanent record to document results obtained from and recommendations made on scientific and technical activities relating to a single project, task, or contract or relating to a small group of closely-connected efforts within the DOD Research and Development program. The system described herein is a method of producing a report of high-quality, proportionally spaced, direct impression typographic copy. These reports receive wide distribution to the scientific and military users, and, after appropriate clearance, may be available to the public.

DD FORM NOV 68 1473 REPLACES DD FORM 1473, 1 JAN 64, WHICH IS OBSOLETE FOR ARMY USE.

Unclassified
Security Classification

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Composing	8					
Systems	8					
Technical Reports	9					
Army Natick Laboratories	4					

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FOREWORD

This report is the second of a series concerned with the recording, retrieval and reproduction of technical data using high speed modern business equipment and sound management practices.

The system described herein is used at these Laboratories for the preparation of technical reports and other documents in support of the Research and Development Programs and related Engineering Programs. The system/equipment used at Natick Laboratories was selected after an extensive review of commercially available equipment and was specifically tailored to meet the needs of these Laboratories.

Technical Reports and other types of Research and Development information such as journal articles, booklets, etc., comprise the publication of work conducted in a variety of scientific endeavors for which these Laboratories have assigned Department of the Army responsibilities.

Acknowledgment is gratefully extended for the continuing support of Mr. Flanagan, Deputy Scientific Director for Engineering at these Laboratories and his determination that the quality of the Technical Reports produced by these Laboratories should be equal to the excellence of the Research and Development performed. Acknowledgment is also gratefully made to Mrs. Gail Tracy, Quality Assurance and Engineering Office who contributed many helpful suggestions.

CONTENTS

ABSTRACT

This report describes a composing system which was found to be suitable for efficiently preparing a wide spectrum of technical and non-technical reports. Documents published for issue by these Laboratories receive wide distribution to scientific and military users and, after appropriate clearance, may be available to the public. The high quality of the graphic presentation of text materials, proportionality of spacing and even margins far exceed the composition normally attained with the conventional method of manual typing.

INTRODUCTION

There is today literally an explosive generation of information. This need for disemination of knowledge in point developed in part because of our increased population, which is more highly educated and cultured than ever. Our population is consuming more published material in the form of books, journals, magazines, and other publications than ever before. And, in the past few years, our technology has increased at a tremendously accelerated rate. The growth of scientific capabilities is stimulated by research conducted in many areas, supported by government and other interests. Naturally this growth has created a flood of information prepared by scientists in all fields of endeavor for publication in books, in scientific journals and in special reports to be delivered at professional meetings.

It is Department of Army policy that the results of all scientific and technical efforts will be recorded in the form of technical documents. All technical documentation will be directed in furtherance of the fundamental Department of Army policy of making maximum information available to the public in keeping with security, ethical, proprietary, or priviledged requirements. Generally the Department of Army encourages publication in recognized scientific or professional journals as a means of recording scientific or technical results and making them widely available. However, when the results are of special significance or immediate interest to the Army, they should be expeditiously published as technical reports even though plans exist for later publication in a journal.

Technical reports are written for the permanent record to document results obtained from and recommendations made on scientific and technical activities relating to a single project, task, or contract or relating to a small group of closely-connected effort within the Department of Defense Research and Development Programs.

It is not unusual for a research and engineering laboratory such as these Laboratories to annually add to its technical library over 70 new scientific reports of its own creation, printed in-plant. This information explosion has placed a great burden of production on the publishing operations of these Laboratories. To cope with the problem of numerous reports, military specifications, regulations, etc. and all with scheduled deadlines, and to provide high-quality proportional spacing, we have added a Magnetic Tape Composer (MT/C) to our typewriter composition capabilities.

The technical reports produced by these Laboratories were formerly composed on a typewriter and reproduced through the medium of photo-offset for mass communication. The finished reports were not at all times prepared and printed in a professional manner. It was decided that this work required high-quality typography equal to the excellence of the research and engineering forming the basis for the report. Proportionally spaced copy produced by the MT/C fulfills this requirement and at the same time provides about

a 20% reduction in the number of pages required for a given text. In addition to proportional spacing of the copy, a selection of the type font from a variety of type styles, weights and sizes is available (see figures 1 and 2). Changing type styles is a simple matter of snapping off one printing element and snapping another in its place. A further advantage of this system is the availability of special fonts for scientific and engineering reporting, thus eliminating manual insertion of special characters.

The growth and advancement in all areas of science has caused an increase in the amount of technical composition assembled today. Many of our technical reports contain numerous technical expressions and equations. By their use the scientist, chemist, engineer or mathematician can convey his thoughts more effectively. The signs and symbols found in equations are a type of scientific shorthand and eliminate the need for pages of complex verbiage. Several symbol type fonts are available for use in composing technical reports. Three are in general use by these Laboratories. They are the Mathematical, Technical and Greek Fonts. The first contains superior numerals, operational signs, base line and superior symbols, fraction bars, radical symbols, signs of relation, plurality, upper and lower case macrons, and vectors. The second contains symbols mainly used in chemistry and physics. Included are parentheses, brackets, operational signs, inferior numerals, electrons, line bonds and diagonal ties, arrow symbols, special characters and symbols. The third contains capital and lower case letters of the Greek alphabet, Greek accent marks, tariff symbols and miscellaneous symbols. Examples of these special fonts may be seen on figure 3.

48. Isolation and Characterization of Gymnemic Acid From *Gymnema Sylvestre*

Investigators: G. P. Dateo, Jr., and L. Long, Jr.

The antisaccharine activity of *Gymnema sylvestre* leaves resides in gymnemic acid, a mixture of triterpenoid saponins. If deacylated, the substances have the common structure of the glucuronide of gymnemagenin, a hexahydroxy-Δ^{2}-oleanene. The major active component, gymnemic acid A_1, has been isolated, but has been ascribed different properties by several investigators.

Gymnemic acid A_1 has been isolated in this laboratory, and, by TLC, has been shown to be a mixture of two components, A_{11} and A_{12}. This discovery necessitated repetition of the anion exchange chromatographic procedures, with the isolation monitored by a new TLC system that resolved A_1 into A_{11} and A_{12}. Full separation of A_{11} and A_{12} was not achieved, but fractions rich in A_{11} were obtained by chromatography on acetate and chloride forms of a quarternary ammonium polystyrene resin. Isolation of A_{11} and A_{12} by TLC is in progress.

The discrepancies in the literature in the properties and proposed partial structure of gymnemic acid A_1 are explainable in that A_1 is a mixture and its properties will vary with the ratio of A_{11} to A_{12}, a factor dependent on variation in source method of isolation. A paper on the isolation and heterogeneity of gymnemic acid A_1 has been submitted for presentation at the 161st National ACS Meeting (Spring 1971).

49. Apiose Chemistry

Figure 1

OPPORTUNITIES TO SUPPORT NATIONAL PROGRAMS OF FEDERAL AGENCIES OTHER THAN DOD

Statement of Goal

NATICK LABORATORIES SEEK OPPORTUNITIES TO APPLY THEIR UNIQUE TECHNICAL CAPABILITIES TO NATIONAL NEEDS OTHER THAN DEFENSE.

Needs

The Report of the President's Task Force on Science Policy stresses the need for a vigorous, high-quality science and technology directed, among other areas, "to the health of business, labor, and the professions; to the quality of our environment; to the personal health and welfare of all; and to the culture, spirit, and inspiration of our people generally". The Task Force also recommended that the President direct the various government departments to bring the tools of science to bear on social and urban problems.

Congressman Emilio Q. Daddario, Chairman, Subcommittee on Science, Research, and Development, in his letter of transmittal of the report "Utilization of Federal Laboratories" briefly summarized the committee recommendations and stated "In particular, the report recommends greater interagency use of Federal Laboratories as a viable alternative to creating new institutions, and shows that Federal Laboratories can be more responsive to solving some of our national problems such as crime, transportation, or pollution."

With the current shift in national priorities from defense to many critical urban and social problems, the Natick Laboratories have the opportunity to respond to the spirit and intent of these reports and to apply their talents and resources towards the solution of national problems other than defense. The problems which the nation faces are so broad in scope and wide ranging in diversity that every potential resource which can contribute to their solution must be mobilized. The relevance of the Natick Laboratories' unique capabilities arises as a consequence of the breadth and depth of experience and concern with the life support needs of the soldier. The scope of operations in support of the soldier is such that contributions may be made in many of the problem areas of national concern with are already

Figure 2

27 Spectroscopic Observation of Coordinated Free Radicals

Investigators: M. Z. Hoffman and M. Simic

The existence of radical transient species coordinated to the metal center has been suggested to account for the kinetic behavior of pentaaminecobalt(III) complexes undergoing reaction with one-electron oxidizing agents. The first such observation is reported below, and was produced from the reaction of OH radicals with $(NH_3)_5Co(O_2CPh)^{2+}$. The pulse radiolysis of aqueous solutions produced the OH radicals (in presence of 1 atm N_2O) and these, on reaction with benzoatopentaaminecobalt(III), gave rise to a transient absorption with λ_{max}~340 nm at pH 3.1 and pH 6.7. This absorption is similar to that produced from benzoate ions. The results indicate that the OH radicals added to the benzoato ligand to from $(NH_3)_5Co^{III}(O_2CC_6H_5OH)^{2+}$.

28. Spectroscopic Investigation of Peroxy Radicals

Investigators: M. Simic and E. Hayon

The optical absorption spectra of the intermediates produced in the pulse radiolysis of liquid cyclohexanol and cyclohexane at 22°C in the presence of 1 atm Ar, N_2O and O_2 have been determined. The $.C_6H_{10}OH$ radical from cyclohexanol was found to have a structureless absorption band with λ_{max} = 240 nm, ϵ_{240} = 1700 $M^{-1}cm^{-1}$ and to decay with $2k = 6.5 \times 10^7 M^{-1}sec^{-1}$. The cyclohexanol $.C_6H_{11}$ radical has an absorption maximum at 240 nm, ϵ_{240} = 1500 $M^{-1}cm^{-1}$ and decays with $2k = 2.4 \times 10^9$ $M^{-1}sec^{-1}$. In presence of oxygen, structureless absorption bands with λ_{max}246 nm (ϵ = 1600 $M^{-1}cm^{-1}$) and 255 nm (ϵ = 1900 $M^{-1}cm^{-1}$) for $.O_2C_6H_{10}OH$ and $.O_2C_6H_{11}$ radicals, respectively, were observed. In the case of the cyclohexyl peroxy radical, following the second order decay of the radical to form the tetroxide, on the basis of the Russell mechanism, two other transients were observed which decayed by a first order process with rates of 5 sec^{-1} and 1.5×10^{-1} sec. A mechanism is tentatively suggested which involves the formation of a trioxide subsequent to the first order decay of the tetroxide.

Figure 3

THE EQUIPMENT

The development of the recent improvements to the typewriter has made available a single-element for typing. Instead of the familiar moving carriage and separate typebars, a round typing head travels across the machine typing at high speed. A change in type face and style is easily accomplished by removing the head and snapping another in its place.

The second development was the addition of magnetic tape to the equipment, which combines the benefits of single-element typing with those of magnetic tape typing. Recording (typing) on a Magnetic Tape Typewriter (MT/T) is comparable to rough draft typing. Errors are corrected when recording by backspacing and striking over the incorrect material. This is explained in detail in the first report of this series (72-39-QA&EO). Thus, although the draft contains corrections and strikeovers, the tape is error-free and playback will produce error-free copy.

The many fine characteristics of single-element typing and magnetic-tape recording and playback were then combined with proportional spacing in the equipment used to type this report; the Magnetic Tape Composer (MT/C). The proportionally spaced copy produced by this equipment, together with the magnetic tape playback capability, provide these Laboratories with a versatile tool capable of meeting the demand for high-quality appearance, high production rate, and error-free copy.

The MT/C comprises three basic components - a magnetic tape reader unit, a "preconditioned" console with control panel, and a composer unit for playback. The playback of magnetic tapes is controlled by the internal mechanism (console) of the MT/C. Integral with the console is a separate prerecorded magnetic tape called a Preconditioning tape. This "Precon tape" contains one or several "precons". At present these Laboratories are using four precons. For example, one precon is designed for special applications which require random playback of paragraphs or insertion of variable data. A second tape (instruction tape) can be recorded with special instructions which will direct the sequence of playback from the other tape. This second tape can also be used when unique variable information must be combined within standard documents recorded on tape.

The complete system in use at these Laboratories consists of the foregoing:

a. A Composer, which is possible to use as a "stand alone" unit.
b. A Preconditioned Console with Control Panel.
c. A Magnetic Tape Reader Unit.
d. A Magnetic Tape Typewriter. This unit is used to record the information on magnetic tape; becoming input, which is used to drive the Composer.

Since these Laboratories have several MT/T units, prior to installing the MT/C it was decided that compatibility between units was highly desirable. Because the MT/C is capable of output only, magnetic tape input must be provided. For example, we wanted to be able to produce tapes on our MT/T units which could then be used to drive the Composer. To accomplish this, these Laboratories record on our MT/T units using a Graphics Record Element which is compatible with the Composer. This allows the MT/T typist to record material on a familiar keyboard by learning a few new key positions. When this is accomplished, Graphic Type Fonts must be used for playback at the Composer.

Copy produced on the MT/T is typed in regular typewriter spacing, i.e., all letters and characters occupy the same amount of space. An elite machine types 12 characters per inch; a pica machine 10 per inch. However, output from the Composer is proportionally spaced. This means that each character is alloted a varying amount of space depending on its configuration. For example, the letter "i" occupies 1/3 the space required for an "m". Type faces also vary in height and are available in three general sizes – small, medium, and large.

Accordingly, measurements on the MT/C are expressed in points, picas and units, similar to the units in common use in the graphic arts industry. Knowledge of this system of measurement is required to compose material for MT/C output.

THE PRODUCTION OF COPY

When a draft of a Technical Report is received for the production of copy, we proceed as follows:

a. The draft is edited and decisions made on the measure (line length), leading (number of lines per page), type face, justification (aligned margins – left, right, or left and right) and codes annotated for insertion of italics, mathematical, Greek, and technical fonts.

b. The edited draft is given to a typist for recording on magnetic tape by an MT/T. Codes must be recorded on the tape when the material is typed to correspond with instruction above.

c. The paper draft produced by MT/T recording is returned to the author for edit. After final edit changes, if any, are made to the MT/T tape, which then becomes an input tape to drive the Composer for production of final copy.

d. Input tape is then loaded in the MT/C and the operator "keys" the control panel. The instructions keyed into the control panel are of vital importance and the heart of the system. The final output of the Composer depends on the skill and knowledge of the operator. Exact correlation between codes entered on the tape and instructions keyed must coincide with the "precon" chosen for the output.

(1) The machine's memory of stored information from a previous job is usually "cleared".

(2) The Composer's "Search" is keyed if more than one tape is involved. Either or both tapes can be searched.

(3) If two tapes are involved, one a correction tape, this instruction must be keyed next and is called "Merge".

(4) "Begin left" is answered only if needed for variable tapes to combine variable information in standard documents and the like.

(5) "Reference code" controls automatic switching between tape stations depending on reference codes recorded.

(6) "Line count" determines lines of text per page.

(7) "Measure" determines line length.

(8) "Input Characters per Tab" determines spaces between tabs.

(9) "Beginning and End Points" control the margin justification.

(10) "Graphics" is answered depending on whether or not output is printed in this font. These Laboratories use the graphics font which allows the typist to use "combinations" involving technical typing.

e. The above sequence of keying operations requires about 1 minute for a competent operator to complete.

Very effective styles and various combinations of copy may be made from the same input tape by keying the control panel with different instructions. For example, a page of solid text can have a figure inserted and the control panel keyed to provide text "run-around" by changing line count and measure during playback.

The finished copy is then ready for printing by the photo-offset method. If, at this stage of the process, last minute changes are required, the changes are easily accomplished. Either the basic tape may be corrected, or a correction tape made and this merged with the basic tape for the production of corrected copy. Usually the correction is typed on bond paper, cut, and pasted in position. Photography will complete the process and eliminate overlay marks.

SUMMARY

The magnetic tape/composer has been in operation at these Laboratories for one year; the magnetic tape/typewriters for five years. A considerable number of technical reports have been generated by the MT/C system and a good estimate of its effectiveness can be made.

Production. As with most automatic sy tems, production rate has increased. This is due mainly to the much faster processing of the document and elimination of retyping and much proofreading. Corrections are easily made and if re-editing is required, only the corrections and additions need be proofed. The typist does not waste time in whole-report retyping or even in whole-page retyping. Automatic restyling/rearrangement of subsequent text is made by the composer after changes are made to any portion.

Quality. This is self-evident as can be seen from the quality of the graphics of this report and figures included herein. This system provides a variety of high quality type styles and faces, uniform (justified right and left) margins, and selective spacing.

Personnel. Wide and enthusiastic acceptance of this system by typing personnel, the scientist and engineer authors of these Laboratories, and from recipients of the reports are a matter of record. Consequently, as much technical reporting as is possible will be processed by this system to upgrade the graphic quality of the output from these Laboratories.

Savings. Although exact figures are not presently available, significant savings usually result when centralization and automation of such a process is effected. Rather than have the typing performed by regular typewriter, by various typists, in various locations throughout these Laboratories, expert and centralized production of high quality reports is now possible. Expertise in this system is acquired only by considerable training at specialized schools, continual use of the equipment, and a study of the Graphic Arts. There are other savings:

a. A report need be retyped only once against the old where two or even three retypings were common.

b. Composing machines make about 20% reduction in pages required and thus save reproduction costs.

c. Saving result from elimination of errors in reader interpretation of hand inserted symbols.

d. Intangeable benefit of graphics quality matching quality of work presented.

Conclusions. Acquisition of the Magnetic Tape Composer (MT/C) has enabled these Laboratories to upgrade the graphic quality of its technical reports and other important communications. It has received enthusiastic support from authors, producers, and recipients. Centralization and expertise has, in addition to the automatic features of the MT/C, resulted in overall savings in technical reporting.